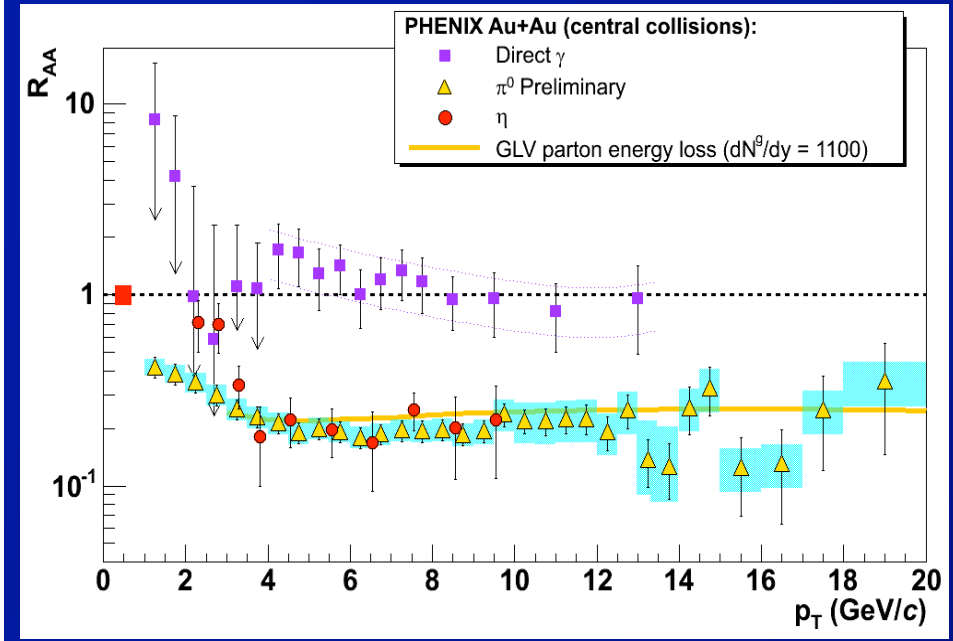
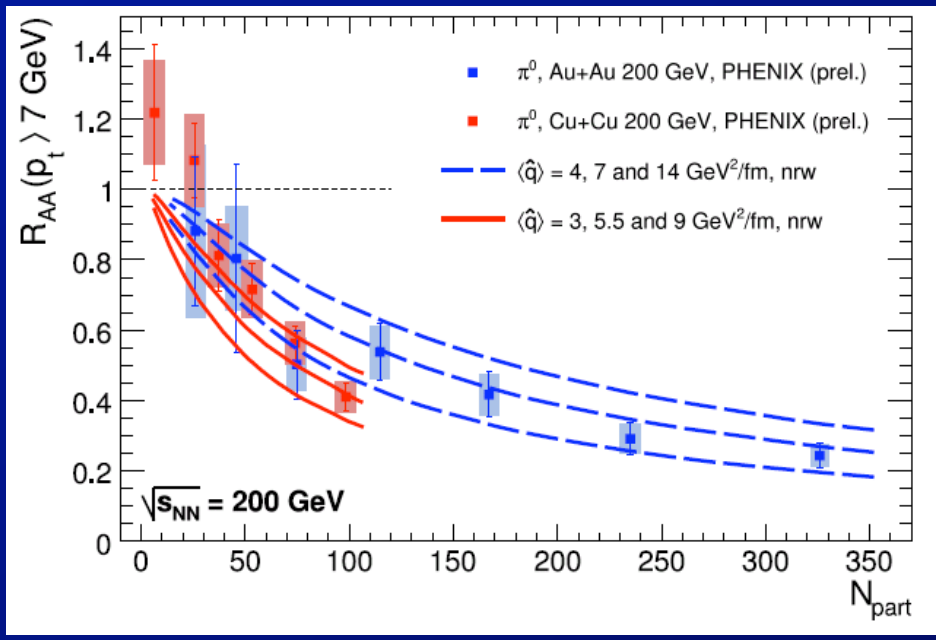
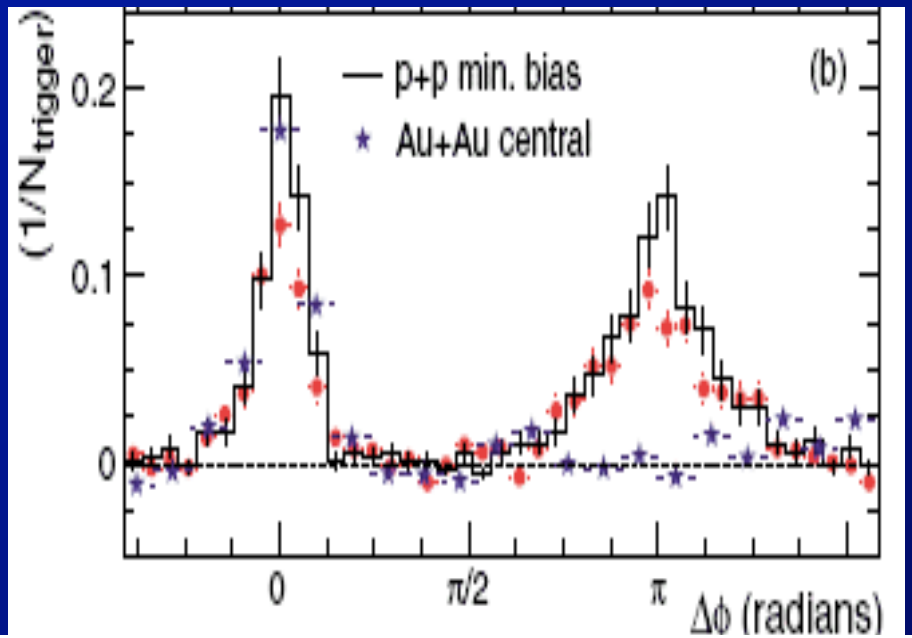
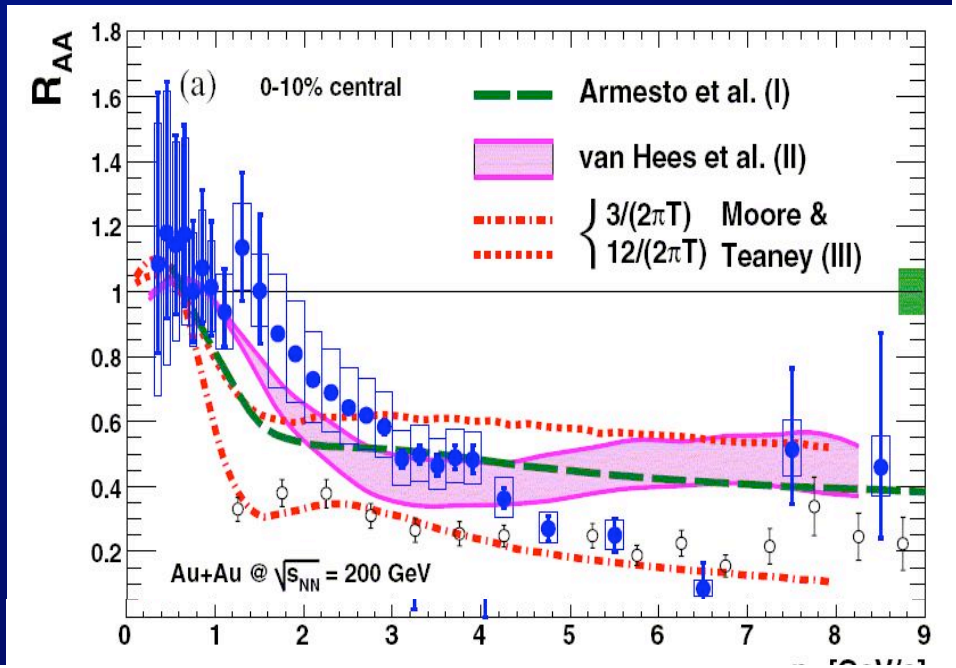
What do we know about quenching?









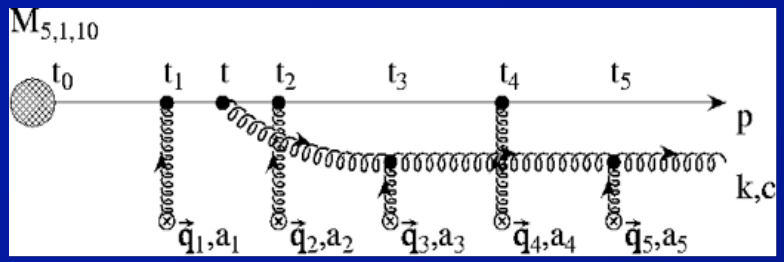
But, Really: What do we know?

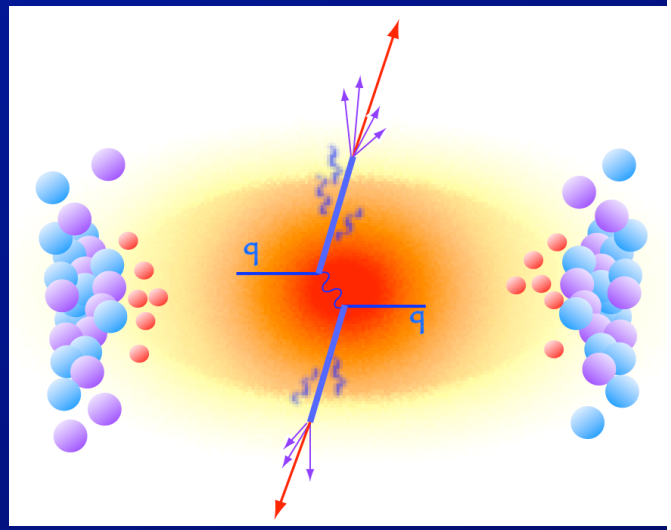
- "Jets" are quenched, but what is the mechanism?
  - Play devil's advocate: if sQGP is correct hypothesis, should we expect perturbative energy loss to apply?
  - Can we prove that perturbative collisional + radiative energy loss is dominant in the RHIC data?
  - If not, what data/measurements would be required?
    - ⇒e.g. Horowitz and Gyulassy
- Suppose we can determine that energy loss is truly perturbative, role of collisional? (e.g.)
  - Can we resolve the theoretical disagreements?
    - ⇒Can we stop talking past each other?
  - Do we understand why results differ?
  - Can experimental data help?
    - ⇒Applies to any issue that we face

Urgent need for progress

- Success of RHIC program has created interest in the field. LHC will also generate interest.
- But, in 8 years of RHIC program, not much progress in really understanding the physics.
  - This pace cannot continue.
  - We must follow up the initial successes at RHIC with real understanding – or interest in field will disappear.
- Need to figure out which questions are important and make concerted attack on them.
  - Requires a coherent effort:
    - ⇒Among theorists
    - ⇒Between theorists and experimentalists

Bootstrapping our way to jet tomography

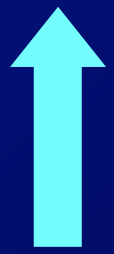




- **Tomography (our goal):**
  - studying an unknown medium with well understood & calibrated probe.
- **Unfortunately, this is not what we are doing**
  - We have assumptions/calculations of medium properties.
  - And incomplete understanding of how our probe(s) interact with that medium.
    - ⇒We must simultaneously test descriptions of the medium and our understanding of energy loss.
    - ⇒Only when we have demonstrated that we have consistent description of energy loss & medium can

From QM2008 Talk: Conclusions

- We desperately need a coherent theory+expt. effor
  - To address issues with energy loss models
  - To test models against consistent set of realistic geometries
  - Examples for how to do this: MRST & CTEQ
    - ⇒Only then can we really bootstrap our way to tomography
- It's time to get past/get over fragility
  - Yes, we know already!
  - But $R_{AA}(p_T, A, N_{part}, \phi\text{-}\Psi)$ absolutely necessary for
- It's too early to try to determine [redacted] to 10, 20, 30%
  - When there are much larger theoretical uncertainties.
  - We experimentalists should be using (and refining our) data to help resolve those theoretical uncertainties.



TECHQM: Theory ⇒ Experiment

- **Enormous effort within experiments making measurements at high p_T.**
  - Clearly, not all of these will have same impact on physics extracted from data.
  - Allocation of effort by experiments almost certainly not optimized to most important problems.
    - ⇒Since currently there is no clear agreement on what the important problems are.
  - Deluge of results has a down-side – "noise"
- **With LHC start-up, there will be even more data.**
  - Jet measurements will explode the phase space of experimental measurements of quenching.
- **TECHQM feedback to the experiments on**

TECHQM: Theory ⇒ Experiment (2)

- There is a strong desire on the part of experimentalists to understand the consequences of their measurements.
  - In a vacuum ideas, good and bad will be spontaneously generated.
- Complicated, subtle theoretical arguments often get lost or are often lost in the sauce.
- TECHQM should:
  - Serve the role of incorporating experimentalists that want to help understand results into effort.
  - Help develpo deeper understanding of theoretical issues by participating experimentalists.
  - help crystalize theoretical understanding for wider understanding by experimental community.

TECHQM: Experiment Interface (2)

- **But, theory community also needs to listen to experiments on what/how well measurements can be done.**
  - e.g. fragility argument has spurred interest at RHIC in di-hadron correlations.
  - But, for same integrated luminosity, correlation measurements much poorer, less control over systematic errors.
  - Can other measurements also address many of the same questions?

    ⇒Theory – experiment interaction a two-way street.
- **Experimental community has extensive experience with numerical, computational techniques that will be valuable to TECHQM.**